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Abstract

PROJECT FOR A HIGH-FLUX EXTRACTED NEUTRON BEAM REACTOR FOR PHYSICISTS

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French requirements in neutron beams of different energies extracted from a reactor are briefly described. The well-known importance of cold neutrons (above 4 A°) is emphasized. The main characteristics of a reactor suitable for physicists are outlined : They are :

1° - A flux of about 7.10^{14} thermal neutrons in the heavy water of the reflector

2° - Maximum flexibility obtained by :

- physical separation of the core and the reflector
- independance of the different experiments
- possibility of modifying physical experiments up to - and including - the nature of the used reflector, without any appreciable interruption in the operation of the reactor.
- reduction of fixed shields to a minimum ; ample use of liquid shields (water) and fluid shields (sands).

3° - Technological continuity as far as possible with French research reactors (SILOE, PEGASE, OSIRIS) already existing or under construction.

4° - Safety of operation arising from simplicity of conception.

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5° - Minimised construction costs. Lowering of the operating costs is looked for indirectly in the simplification of the solutions and the reduction of operating staff, rather than directly by reducing the consumption of fuel elements and energy.

The recommended solution can be described as a closed-core non-pressurized swimming-pool reactor, highly under-moderated by the cooling light water.

Surrounding the reactor are a number of "beam tubes-loops" each consisting of :

- a part of the reflector (heavy water in the example described)
- a part of neutron extraction beam tube
- the circuits required for their cooling
- the inlet systems of suitable fluids to the beam tube nose (liquid hydrogen in the example described)
- the necessary outlets for measurement and control system.

The whole "beam tubes loops" is immersed in the water of the metallic self-supporting swimming-pool.

The shielding outside the swimming-pool is composed for the most part by heavy sand in which is the rest of the beam extraction tubes and the experimental equipment which can support doses much higher than the ones which are biologically permissible.

The final part of the communication describes the studies carried out on the realization a liquid hydrogen cold sink, one of the most important experimental devices envisaged.